

REMARKS/ARGUMENTS

Claims 1, 3-4, 7 and 9 are active in this application, claims 2, 5-6 and 8 having been cancelled. Claim 1 has been amended to clarify that at least 30% by mass of the aromatic vinyl compound unit of polymer block (A) are alkyl-styrene derived structural units (I). Claim 1 has also been amended to specify that 70% or more of the carbon-carbon double bonds resulting from the conjugated diene compound units of polymer block B are hydrogenated. This amendment is supported by the specification at page 16, lines 2-5. No new matter has been added by these amendments.

The present invention relates to a polymer composition containing an addition polymerization-based block copolymer (a), an acrylic resin (b), and a softener (c), wherein the addition polymerization-based block copolymer (a) has a weight average molecular weight of 30000 to 200000 and is at least one selected from block copolymers comprising at least one polymer block A and at least one polymer block B, and hydrogenated products of the block copolymers; the polymer block A comprises mainly an aromatic vinyl compound unit wherein at least 30% by mass of the aromatic vinyl compound units are alkylstyrene-derived structural units (I) in which at least one alkyl group having 1 to 8 carbon atoms is bound directly to a benzene ring; the polymer block B comprises a conjugated diene compound unit wherein 70% or more of the carbon-carbon double bonds resulting from the conjugated diene compound units of polymer block B are hydrogenated; and the components of the polymer composition are present in respective proportions (by mass) so that the following relationships (1) and (2) hold:

$$0.05 \leq W_b/W_a \leq 2 \quad (1)$$

$$0 \leq W_c/(W_a+W_b+W_c) \leq 0.5 \quad (2)$$

where W_a , W_b , and W_c are the amounts (by mass) of the components of the polymer composition: the addition polymerization-based block copolymer (a), the acrylic resin (b) and the softener (c), respectively, wherein the polymer composition has a sea-island morphology; wherein the acrylic resin (b) is a homopolymer of methyl methacrylate or a copolymer of methyl methacrylate and one or more copolymerizable monomers selected from the group consisting of acrylic acid, metal salts of acrylic acid, acrylic acid esters, methacrylic acid, metal salts of methacrylic acid, methacrylic acid esters, vinyl acetate, aromatic vinyl compounds and maleimide compounds; and wherein the polymer composition, when formed into a 2mm thick sheet-shaped article and tested for the Taber abrasion according to JIS K 6264, gives a Taber abrasion of 100mm^3 or less, the test conducted by abrading the sheet with an H-22 abrasion disk at 1000rpm while applying a 1kg load. Applicants have found that by requiring their polymer compositions to meet the requirements of the present claims, namely with respect to the use of an alkylstyrene derived structural unit where the alkyl group is directly bound to the benzene ring, the ratio of amount of a block copolymer (a), the amount of an acrylic resin (b), and the amount of softener (c), and by requiring that the composition have a sea-island morphology, the resulting compositions have significantly improved heat resistance, weather resistance, rubber elasticity, mechanical properties, transparency, scratch resistance and abrasion resistance. Some of these properties, such as scratch resistance and transparency, are believed to be provided by the particular phase structure (morphology) formed by blending an addition-polymerization block copolymer (a), an acrylic resin (b), and a softener in the required ratios. Others, such as heat resistance and weather resistance are believed to be provided by the fact that the carbon-carbon double bonds resulting from the conjugated diene units of polymer block B are hydrogenated in a specific amount.

The claims stand rejected under 35 U.S.C. 103 over Toshinori, optionally in view of Dekking. Toshinori discloses a disintegrable resin composition containing a block copolymer

and a thermoplastic resin, preferably combined in a proportion of 5:95 to 95:5. The block copolymer of Toshinori contains conjugated diene units and vinyl aromatic hydrocarbon units, where the vinyl aromatic hydrocarbon is contained in an amount of 5-95 wt% and the conjugated diene has a vinyl bond amount of 15% or more. Toshinori discloses that their composition readily disintegrates, meaning that the substance disintegrates gradually by irradiation of light over a specific period (see page 3 of English translation). This disintegration capability is taught by Toshinori to specifically require the use of a particular block copolymer having a vinyl-bond of the conjugated diene present in a specific amount. Thus, because it is critical to Toshinori to have at least a specific amount of carbon-carbon double bonds resulting from the conjugated diene portion of their block copolymer, Toshinori cannot suggest the present invention which requires that at least 70% of the carbon-carbon double bonds be hydrogenated.

Further, Toshinori's composition can contain a softener, preferably in an amount of 40 to 80 parts by weight per 100 parts by weight of the total amount of block copolymer and thermoplastic resin (see pages 22-23 of the English translation of Toshinori). However, for the Examiner to suggest that one of ordinary skill would somehow be led by the teachings of Toshinori to choose to combine an addition polymerization based block copolymer with an acrylic resin and a softener; **and** to somehow choose the block copolymer to have the necessary block A comprising mainly an aromatic vinyl compound unit containing at least 30% by mass of an alkylstyrene-derived structural unit having at least one alkyl group having 1-8 carbon atoms bound directly to the benzene ring, **and** to choose the acrylic resin to be a homopolymer of methyl methacrylate or a copolymer of methyl methacrylate and one or more copolymerizable monomers selected from the group consisting of acrylic acid, metal salts of acrylic acid, acrylic acid esters, methacrylic acid, metal salts of methacrylic acid, methacrylic acid esters, vinyl acetate, aromatic vinyl compounds and maleimide compounds;

as required in the present invention; **and** to choose the relative amounts of these components and the softener to meet the relationships (1) and (2) of the present claims; **AND** to choose to have at least 70% of the carbon-carbon double bonds resulting from the conjugated diene compound units be hydrogenated; is stretching the teachings of Toshinori beyond recognition. It is simply too much picking and choosing, and certainly, one of ordinary skill would not make these choices based on Toshinori's teachings, with any expectation of having the improvements in properties shown by Applicants compositions!

Toshinori's listing of possible thermoplastic resins covers over 3 pages of text, and a vast array of polymers. Further, **none** of the preferred thermoplastic resins taught at page 22 of the English translation are acrylic based resins, nor are any of the working examples. There is only a passing mention of an acrylic resin such as polymethyl methacrylate at pages 19-20 of the English translation.

Further, even if one of ordinary skill were to somehow arrive at this combination of the three components, Toshinori says NOTHING about improving transparency, scratch resistance and abrasion resistance. Accordingly, one of ordinary skill in the art could have no way of expecting that choosing any combination of components from Toshinori would have any effect on those properties at all!

The Examiner has attempted to overcome these deficiencies of Toshinori by the use of Dekking. Dekking teaches that it is known in the plastic art to use inexpensive particulate fillers to extend polymers and reduce material costs, and that certain of these fillers provide reinforcing, better abrasion resistance and increased hardness. However, that is not the present invention.

The present invention uses a particular combination of a block copolymer, an acrylic resin and a softener to achieve a specific phase structure/morphology and result in improved abrasion and scratch resistance, and improved transparency. Further, the present invention

also requires that the ratios of the components meet certain limitations, and that the block copolymer have at least 30% by mass of an alkylstyrene-derived structural unit (I) in polymer block (A). These specific requirements are nowhere found in either of the two references, and one of ordinary skill would not arrive at such a combination of required elements based on the references teachings. Dekking's only teaching is to improve abrasion resistance by adding an inorganic particulate filler. That is completely different from the present invention. If the Examiner is basing this combination rejection on Dekking teaching that it is desirable to improve abrasion resistance in polymer compositions, this still does not provide any guidance to one of ordinary skill in the art on HOW to modify Toshinori, or WHICH components to pick from Toshinori, or WHAT would be the properties of the resulting composition if they did so! There is nothing in Dekking that would lead one of ordinary skill in the art to pick and choose from Toshinori, or modify the teachings of Toshinori, in such a way as to arrive at the present invention. Even if every one of the individual components of the present invention were taught somewhere throughout the disclosure of Toshinori, there is NOTHING within Toshinori to lead to the particular combination of elements of the present invention, NOR the particular ratios of the various components, NOR the requirements that the carbon-carbon double bonds of the units from the conjugated diene compound be at least 70% hydrogenated, NOR the requirement that at least 30wt% of the aromatic vinyl units be alkyl styrene units. Dekking provides NOTHING to suggest such a combination of the various elements of the present invention. In fact, the only thing for which Dekking has been used by the Examiner is a teaching to improve abrasion resistance by addition of an inorganic particulate filler to the composition. That is NOT the present invention and cannot result in making the present invention obvious. Combining that teaching with Toshinori, still CANNOT result in the specific combination and requirements of the present invention.

Even if the Examiner maintains his position regarding the references, the specification provides Examples 1-8, in which there is used a block copolymer containing polymer block A containing the structural unit (I) as required in the present invention. Comparison Examples 5-7 do not contain such an alkylstyrene derived structural unit, but merely contain styrene in polymer block A instead (Applicants note that Toshinori specifically teaches at page 11 that styrene is particularly preferred as their aromatic vinyl compound). As shown in the specification, Examples 1-8 provide significantly improved abrasion-resistance or taber-abrasion resistance compared to Comparison Examples 5-7. In particular, it is noted that the compositions of Examples 1, 2, 5 and 8 are the same as the compositions of Comparative Examples 5, 7, 6, and 5, respectively, with the difference being that Comparative Examples 7, 6 and 5 contain NO alkylstyrene-derived structural unit (I), and only contain styrene units in polymer block (A) (it is noted that Example 1 and Example 8 differ from one another in that Example 1 uses block copolymer 1, which has polymer block (A) containing only the alkylstyrene-derived structural unit (I), while Example 8 uses block copolymer 2, which has polymer block (A) containing 50/50 styrene/alkylstyrene-derived structural unit (I)). As shown, the present invention Examples provide significantly improved abrasion resistance and significantly improved scratch resistance compared to the Comparative Examples. Such improvements CANNOT be suggested by the combination of references, based upon merely changing the monomers used to form the block copolymer. As such, the results in the specification are sufficient to rebut any asserted case of obviousness based upon the references cited. The fact that the Dekking reference teaches the use of fillers to improve abrasion resistance and hardness is IRRELEVANT, since this still does not suggest that one can achieve significant improvements in abrasion resistance and scratch resistance by the use of a block copolymer as required in the present invention. Accordingly, the rejection cannot stand and should be withdrawn.

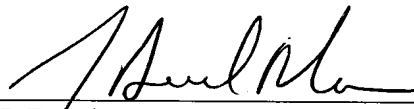
Application No. 10/531,307

Response to Office Action dated May 3, 2010

Applicants submit that the application is now in condition for allowance and early notification of such action is earnestly solicited.

Respectfully submitted,

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A handwritten signature in black ink, appearing to read "J. Derek Mason", is written over a horizontal line.

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(OSMMN 08/07)